

Multiple Choice

1. A student found a sample of a solid material that was gray, shiny and made of all the same material. What category does this sample best fit?
 - A. sedimentary rock
 - B. igneous rock
 - C. metamorphic rock
 - D. mineral

2. A fourth grade class observes rocks. One sample is found in layers and feels rough and grainy. Which type of rock is it?
 - A. sedimentary
 - B. igneous
 - C. granite
 - D. metamorphic

3. Which correctly matches the rock type with the process involved in forming the rock?

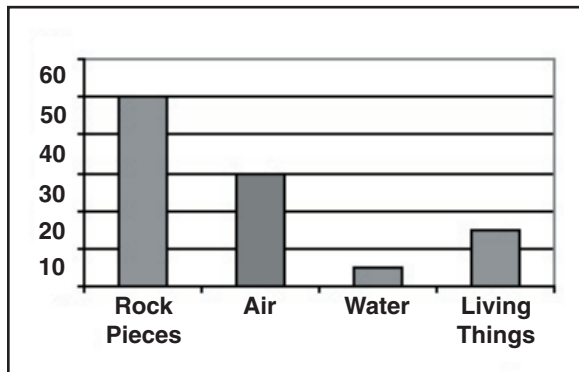
<u>Rock Type</u>	<u>Process</u>
A. igneous	- pressure and heat
B. sedimentary	- erosion and weathering
C. fossils	- molten rocks and magma
D. metamorphic	- heating and melting

4. Obsidian, granite, and basalt are rocks formed from molten rock that has cooled. What kind of rocks are they?
 - A. sedimentary
 - B. fossils
 - C. igneous
 - D. metamorphic

5. What is the movement of weathered materials called?
 - A. ice wedging
 - B. erosion
 - C. weathering
 - D. evaporation

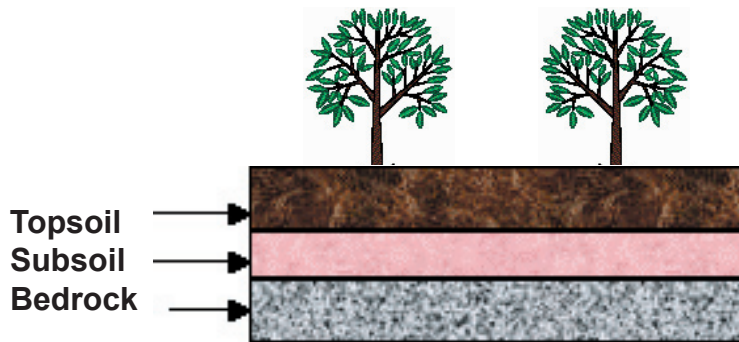
6. What direction does erosion move Earth materials?
- A. toward the mountains
 - B. into cities
 - C. downward
 - D. upward
7. Which of the following shows that soil erosion is happening?
- A. The soil is deep and grows grass on top.
 - B. The soil has deep gullies.
 - C. A forest of pine trees grows in the soil.
 - D. Pavement is placed on the soil for a road.
8. A home has a sloping backyard. The family puts in retaining walls made of large boulders part way down the hill. Why?
- A. They look nice.
 - B. They keep soil in place.
 - C. To improve the view.
 - D. To keep the house from rolling.
9. Sally dug up some soil, put it in a cup and weighed it. She put it in a warm place with no cover. Two weeks later she weighed it again. It weighed less than before. Why?
- A. Water had evaporated.
 - B. The soil was warmer.
 - C. There were fewer living things.
 - D. The cup had changed shape.

Use this graph of a soil sample to answer the next two questions. It shows the percentages of rock pieces, air, water and living things.



10. What is this soil mostly composed of?
- A. rock pieces
 - B. air
 - C. water
 - D. living things
11. If the percentage of water went up, which other part would most likely go down?
- A. none would
 - B. air
 - C. water
 - D. living things
12. If plants are not growing well in a soil, what is one way to fix it?
- A. Take away air.
 - B. Take away mineral particles.
 - C. Add nutrients.
 - D. Add subsoil.
13. What is the main reason plants need soil?
- A. for food
 - B. to hold them in place
 - C. to make water
 - D. to keep them alive

Use this soil profile to answer the next two questions:



14. Which soil layer would you expect to find the largest rocks in?

- A. topsoil
- B. subsoil
- C. bedrock

15. What gives the topsoil its dark color?

- A. special types of rock particles
- B. more water
- C. larger rock pieces
- D. decaying living things

Constructed Response

1. Students looked at 5 rock samples with magnifying hand lenses. Look at the chart below and answer the next three questions.

Sample	Crystal shape	Color (s)
1	yes	white
2	no	Speckled, light and dark
3	no	Red and brown
4	yes	Gold
5	yes	yellow

- Which of the above samples would be classified as minerals?
 - Which would be rocks?
 - What do the rocks have in common?
 - What do the minerals have in common?
2. What is the difference between erosion and weathering?
3. If you were given an unknown soil sample and asked to describe it, what traits would you look for?
4. Describe three things that might be in a soil sample and explain how they got there.
5. A soil sample is dark in color and moist feeling. Another soil is lighter in color and feels slippery. Which soil would be found deeper in the ground? Why?

Answers for Standard 3-unit test A:

Multiple Choice

1. *D*
2. *A*
3. *B*
4. *C*
5. *C*
6. *C*
7. *B*
8. *B*
9. *A*
10. *A*
11. *B*
12. *C*
13. *B*
14. *C*
15. *D*

Constructed Response

1.
 - a. *#1, #4, and #5 could be minerals.*
 - b. *#2 and #3 would be rocks.*
 - c. *The rocks do not have a crystal shape and are made from a collection of minerals.*
 - d. *The minerals have a crystal shape and are made of one substance.*
2. *Weathering is the breakdown of rock into smaller pieces; erosion is when it is carried away.*
3. *color, texture(feel), odor, particle size and compaction*
4. *Rock pieces-from rocks weathering and eroding, water-from rain, air-fills empty spaces, living things (earthworms, bugs)-travel through the soil, dead things-fall on soil and decay.*
5. *The lighter colored soil because it doesn't have organic matter and does have clay.*

Multiple Choice

1. Which of the following best describes the relationship between a rock and a mineral?

- A. Rocks are pure substances; minerals are not.
- B. Rocks are made from minerals.
- C. Minerals are made from rocks.
- D. Rocks and minerals are the same thing.

2. A rock sample has been changed by heat and pressure. Which type of rock is it?

- A. sedimentary
- B. fossils
- C. igneous
- D. metamorphic

3. Sandstone, shale, limestone and conglomerate are common rocks in Utah. They form colorful rock formations and canyons. What type of rock are they?

- A. sedimentary
- B. fossils
- C. igneous
- D. metamorphic

4. Which of the following is NOT a way rock is broken down and weathered?

- A. freezing and thawing
- B. plant roots
- C. heat expansion
- D. carried away by wind

5. What forms after a rock has been weathered over many years?

- A. soil
- B. a stream
- C. valleys
- D. a lake

6. When are soils most likely to erode?
- A. When they are moist
 - B. When they are deep
 - C. When the plant cover is gone
 - D. At night or on cloudy days
7. A water truck keeps the soil wet at a construction site. Why?
- A. to keep the soil from blowing away
 - B. to keep the workers cool
 - C. to help new plants grow when they are planted
 - D. it looks better when it is wet
8. A piece of rock from a mountaintop is found on a beach near an ocean. What is this an example of?
- A. soil
 - B. weathering
 - C. ice wedging
 - D. erosion
9. A student pours water into a clear cup of soil. He sees air bubbles coming out of the water as it sinks into the soil. Where are the air bubbles coming from?
- A. the water
 - B. the soil
 - C. the cup
 - D. decaying things

Constructed Response

1. Explain two ways you can tell a sample is a rock and not a mineral sample.
2. Name or describe three examples of erosion in our area.
3. Describe the type of soil you would like to have to grow a good garden.
4. Name 2 living and 2 nonliving things that are found in soil.
5. A student rubs a soil between her fingers. It feels gritty. Why?

Answers to Standard 3-unit test B

Multiple Choice

1. *B*
2. *D*
3. *A*
4. *D*
5. *A*
6. *C*
7. *A*
8. *D*
9. *B*

Constructed Response

1. *A rock sample has a combination of minerals, can be classified as sedimentary, igneous or metamorphic, is often more than one color, has bands, etc.*
2. *Answers will vary.*
3. *Soil with a mixture of particles, sizes, and lots of decaying plant material to hold water and provide nutrients.*
4. *Nonliving: pieces of rocks or minerals, water, dead plants, air
Living things: worms, bugs, bacteria, plants.*
5. *The sample has mineral particles in it.*

Performance Test 1

Which Rock is It?

Activity Description

Students will identify whether rock samples are igneous, sedimentary or metamorphic.

Materials Needed

a variety of igneous, sedimentary, and metamorphic rocks that have been labeled by number (six rocks per student), pencils and paper

Prior to Assessment

Students should have been introduced to the rock cycle and the salient features of igneous, sedimentary and metamorphic rocks.

Time Needed for Assessment

one class period of 45 to 60 minutes

Procedure

1. Give each student six different rocks.
2. Have students classify each rock into one of three categories: igneous, sedimentary, metamorphic. (Students would identify each rock by its number.)
3. Students should also explain what feature(s) of the rock that helped them to decide what kind of rock it is.
4. A data table such as the one below may be provided:

Sample #	Observations	Rock Type
1		
2		
3		
4		
5		
6		

Suggested Scoring Guide:

1. Each rock correctly identified as sedimentary, igneous or metamorphic..... 6 pts
2. Each rock for which at least one relevant salient feature was identified..... 6 pts
possible 12 pts

Performance Test 2

Soil Erosion

Activity Description

Students will compare erosion occurring on two soil surfaces, one with plant cover and one without.

Materials Needed

pie plates or cake pans (any dish with a 1-3 inch rim), soil, sod, watering can, transparent cups, copies of worksheet

Prior to Assessment

Students should know that erosion is the process of weathered materials (soil) moving from one place to another. They should be familiar with the scientific method.

Time Needed for Assessment

two hours, or two 1-hour periods on different days

Procedure

1. Introduce students to the research question "How does the surface of the soil affect how it erodes? This experiment can be done in individual groups by students or as a demonstration by the teacher.
2. Describe how the problem will be tested. A control pan with soil firmly packed in it will have a cup of water sprinkled over it with a watering can or other means. The pan needs to be placed at a tilt so that the water runs off. The run-off water should be collected in a transparent cup and allowed to settle.
3. Have students make a hypothesis concerning the addition of sod to the pan. They should write an "If, then" statement. Ex: "If we add sod, then less water and soil will run off."
4. A piece of sod cut from a lawn (it can be done in winter or summer, it doesn't matter if the grass is green) should be fitted into another pan of the same size or the same pan. It should fill the pan to the same level as the control did. Once again, a cup of water should be poured on it and the residue collected.
5. The two cups collected should be compared. Students may draw them for their "data." The amount of soil should be noted.
6. Challenge the students to bring in other materials that can cover the soil surface. They may have seen netting or retaining walls next to highways used to control erosion.
7. Students should write additional hypotheses as they develop their own experiment. They should carry out their experiment and record the results. The experiment can be finished by asking the students questions such as:
 - a. Which soil surface eroded the most? (*bare soil*) least? (*probably sod*)
 - b. A surface that protects the soil will help prevent soil erosion. What does it do for the amount of water absorbed by the soil? (*increases water absorption.*)
 - c. What do people do that increases soil erosion? (*clear plants off land for buildings, farms, parking lots, etc.*)
 - d. How can people prevent soil erosion? (*keep soils covered*)

8. Students should write a conclusion that includes an evaluation of their hypothesis. Ex.
My hypothesis was correct; if you add sod to the soil it will erode less.

Suggested Scoring Guide:

- | | |
|---|-----------------|
| 1. Student makes a hypothesis for every experiment performed..... | 5 pts |
| 2. Students draws data for each experiment..... | 5 pts |
| 3. Student correctly answers questions..... | 5 pts |
| 4. Student writes a conclusion..... | <u>5 pts</u> |
| | possible 20 pts |

Sample worksheet:

Soil Erosion

Research question: How does the surface of the soil affect how it erodes?

Procedure:

1. Two pans will have soil in them. One will have bare soil the other will have sod from a lawn.
2. Water will be poured on the top of each and the pan will be tilted.
3. Water that runs off will be collected in a cup.
4. Design your own soil surface. You may shape it or put something on it. Write down what you will do and then perform the experiment.

Hypothesis:

If soil is left bare, then (more, less, or the same?) water will run off?

Data:

Drawing of experiment:

Your experiment:

Procedure:

- 1.
- 2.
- 3.
- 4.

Hypothesis:

Data:

Drawing of your experiment:

Questions:

- Which soil surface eroded the most? least?
- A surface that protects the soil will help prevent soil erosion. What does it do for the amount of water absorbed by the soil?
- What do people do that increases soil erosion?
- How can people prevent soil erosion?

Conclusion: Look at your hypothesis and see if you were right. Write a sentence that summarizes the experiments.

Performance Test 3

Soil Tests

Activity Description

Students will do two tests on soil. One will see how much air is in soil and the other will test how much water is in soil.

Materials Needed

tall, straight-sided glasses (2 per group) sandy soil, glass marker, a source of soil from outside, plastic container, a balance (or weighing device of some kind), student worksheet

Prior to assessment

Students should know that soil contains air and water. They should know how to use a balance or other weighing devices.

Time Needed for Assessment

One hour, then a period of time for the soil to dry, then time to weigh it and finish.

Procedure

Water test

1. Students should receive worksheets and a plastic container with soil from the schoolyard.
2. They should weigh it and record on their lab sheet. A hypothesis can be made concerning what will happen to the weight after a week.
3. The dish should be placed in a warm place where it will not be disturbed for a week.
4. At the end of the week, students should reweigh the dish. It will have lost weight depending on how wet it was to start. They can subtract the two numbers to find out how much was lost.
5. An extension of this activity would be to have students collect soil from several locations and compare moisture content.

Air test

1. Students should fill one glass half full of the sandy soil.
2. They should fill the other glass half full of water.
3. Ask them what will happen if the water is poured into the sand. Have them write this down as their hypothesis.
4. Students should pour the water into the sand, slowly, and write down what they see.
5. The water will fill the air space in the sand. Remind the students that two half full glasses should have made one full cup. (It will be about 3/4 full now)
6. Ask, "How much of the sand was air?" (It is the space between the water level and the top of the glass. Sand is around 25-40% air, depending on the grain size)
7. Students can draw the glass at the end and indicate on their drawing how much air was in the sand.

Suggested Scoring Guide:

1. *Student records data for both labs* 5 pts
 2. *Student subtracts to find water loss*..... 2 pts
 3. *Student makes hypothesis for both labs*..... 4 pts
 4. *Student draws glass and indicates air space* 4 pts
- possible 15 pts*

Sample Worksheet

Soil Testing

Water Test

Hypothesis:

Data:

1. weight on first day _____
2. weight on last day _____
3. difference _____

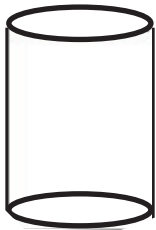
Air Test

Hypothesis:

Data:

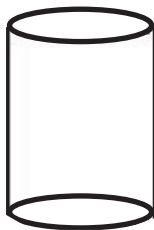
1. Drawing of glasses:

glass with soil



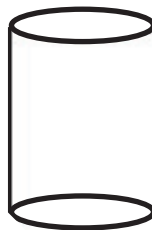
1

glass with water



2

glass with water and soil



3

Show on drawing 3 how much air was in the sand.